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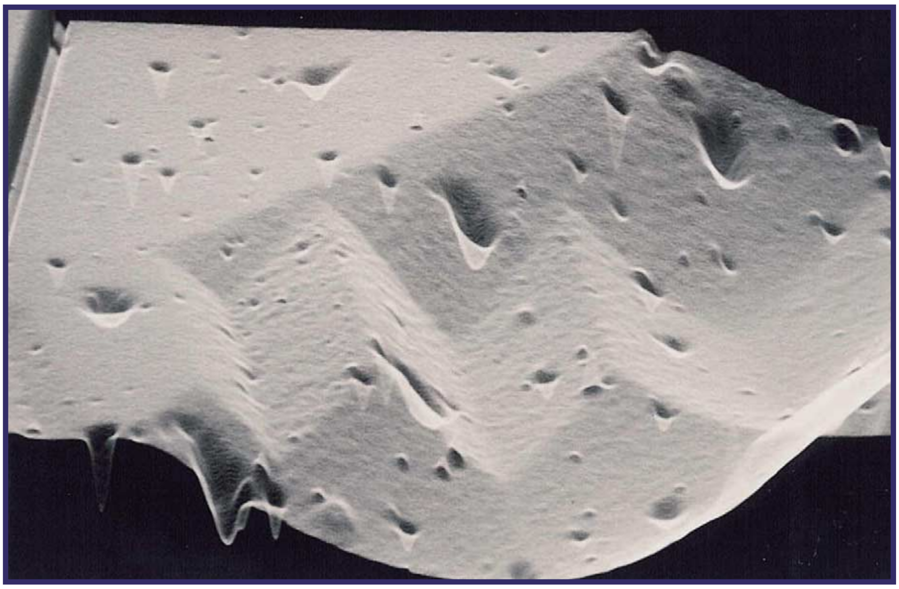
A cursory glance at who is playing in the chalcogenides field and what applications are appearing, finds a range of topics from memory to photovoltaics and non-invasive measurement. But in the main the players cannot be drawn into discussing their development and devices, so one is left ruefully looking at the patents and presuming that some sense of concerted development, apart from that of activity, will emerge.

Chalcogenide players stay in the shade

Back in February, one company synonymous with chalcogenides, Ovonyx, licensed Elpida, a DRAM manufacturer based in Tokyo, Japan and set up by NEC and Hitachi at the end of 1999, to "utilise Ovonyx's phase-change technology to further explore the development of new DRAM features that will provide the high performance and low current consumption required for next-generation mobile applications."

February was a good month for chalcogenide patents, for instance in one entitled graded Ge_xSe_{100-x} concentration in PCRAM, Micron Technology Inc was awarded patent 6856002 for providing a design for a PCRAM element which incorporates multiple metal-containing germanium-selenide glass layers of diverse stoichiometries. The invention also provides a method of fabricating the PCRAM structure. The inventors are John More; Terry Gilton and Kristy Campbell.

Terry Gilton is the brain behind another patent, 6,855,975, for a diode device and integrated programmable conductor memory cell, where the diode device in an integrated circuit comprises a diode and a glass electrolyte element, the glass electrolyte element having metal ions mixed or dissolved in it and being able to selectively form a conductive pathway under the influence of an applied voltage. In one embodiment, both the diode and the memory cell comprise a chalcogenide glass, such as germanium selenide (e.g. Ge_2Se_8 or $Ge_{.25}Se_{75}$).



Courtesy: www.nanoptek.com/ images/chalcogenide.jpg

The first diode element comprises a chalcogenide glass layer having a first conductivity type, the second diode element comprises a chalcogenide glass layer doped with an element such as bismuth and having a second conductivity type opposite to the first conductivity type, and the memory cell comprises a chalcogenide glass element with silver ions. In another format, the diode comprises silicon and there is a diffusion barrier layer between the diode and the chalcogenide glass memory element. Methods of fabricating integrated programmable conductor memory cell and diode devices are also available.

Another patent, 6,518,086, on a processing approach towards the formation of thin-film Cu(In.Ga)Se_2. The two-stage method of producing thin-films of group IB-IIIA-VIA on a substrate for semiconductor device applications includes depositing an amorphous group IB-IIIA-VIA precursor onto an unheated substrate, the precursor containing all of the group IB and group IIIA constituents of the thin-film to be produced in stoichiometric amounts desired for the final product.

A second stage involves subjecting the precursor to a short thermal treatment at 420-550°C in a vacuum or an inert atmosphere to produce a single-phase, group IB-III-VIA film. The precursor comprises preferably, the group VIA element in the amount desired for the final semiconductor thin-film. The group IB-IIIA-VIA semiconductor films may be, for example,

$Cu(In,Ga)(Se,S)_2$ mixed-metal chalcogenides. The resultant supported group IB-IIIA-VIA semiconductor film is suitable for use in photovoltaic applications. The assignee is Midwest Research Institute, Kansas, MO and the inventors are Markus Beck and Rommerl Noufi.

US patent 6,850,432 in February is for a laser programmable, electrically readable, phase-change memory method and device and has been assigned to Macronix International Ltd. Roughly described, a phase-change memory such as a chalcogenide-based memory is programmed optically and read electrically. No complex electrical circuits are required for programming the cells. On the other hand, this memory can be read by electrical circuitry directly. The read out speed is much faster than for optical disks, and integrated circuit chips made this way are more compatible with other electrical circuits than are optical disks. Thus memories, according to the invention, can have simple, low power-consuming, electrical circuits, and do not require slow and power-hungry disk drives for reading. The invention therefore provides a unique low power, fast read/write memory with simple electrical circuits. The inventors were Chih-Yuan Lu, and Yi-Chou Chen.

More recently, Samsung Electronics has been awarded US patent number 6,849,892 for a phase changeable memory device with reduced cell areas - the work of Horii Hideki. Here, a phase changeable memory device includes an IC substrate and two active storage regions on the IC substrate with two separate widths and the transistor active region is between the first and second active widths, which are less than the width of the active transistor region.

California based Q Steps Technologies staff, Walter Proniewicz and Dale Winther worked to win patent 6,853,854, a non-invasive measurement system which provides a technique for manipulating wave data. In particular, biological wave data, and the reflected wave data is correlated to a substance ie blood or a human. The wave data may comprise light waves. The substance may be a molecule (e.g. glucose) or ionic substance.

The wave data is used to form a matrix of pixels with the received wave data. The matrix of pixels may be modified by techniques of masking, stretching, or removing hot spots. Then, the pixels may be integrated to obtain an integration value that is correlated to a glucose level.

The correlation process can use a lookup table, which may be calibrated to a particular biological entity. Moreover, an amplitude and phase angle may be calculated for the reflected wave data and used to identify a glucose level in the biological entity. The glucose level is displayed on a monitor attached to the computer, which is either a portable, self-contained unit that comprises a data processing system and a wave-reflection capture system, or one attached to a network of others, so the reflected wave data is received by the computer and forwarded to others in the network for processing.

Back in March, graduate student Nakeeran Ponnampalam (at TR Labs Edmonton, Photonics) was awarded a two year NSERC Industrial PostGrad Scholarship of $15K/pa. TRLabs "tops up" with a $6K/yr scholarship contribution. This will allow Nakeeran to follow his specific research interest - chalcogenide glasses for use in passive/active optical waveguide components.